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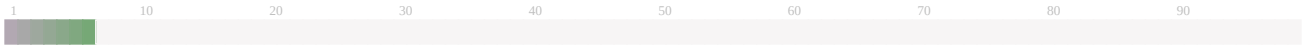

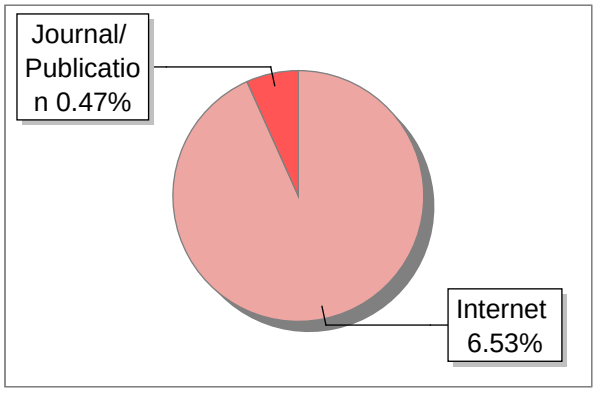

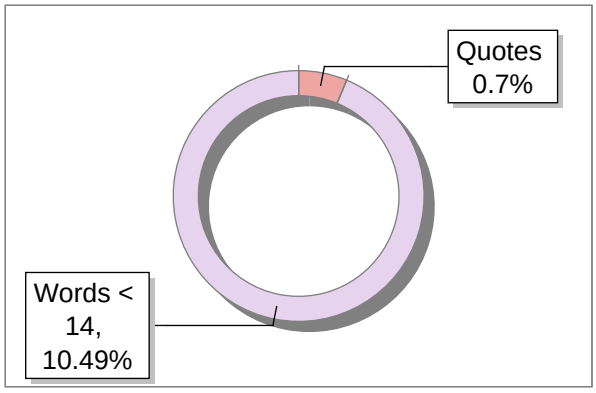

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Development of Integrated exercise protocol for Computer Professionals with Cervical Spondylosis

INTRODUCTION

Integration means “to construct, coordinate, or combine into a working or unified whole., ” “ to combine with something else, ” and “to incorporate into a bigger unit” (1)

Integrating exercises has been suggested as a possible substitute for individual exercises (1, 2, 3, 4). One benefit of integrated training is that it can be carried out without additional time being set aside for training (1, 2).

Musculoskeletal disorders (MSD) are a group of clinical illnesses that result from the slow buildup of soft tissue injury that occurs when the tissues of the musculoskeletal system are subjected to various stresses. There are numerous risk factors that have been connected to the development of MSD, including physical factors, psychological factors, and occupational variables, which deteriorate the health and welfare of workers (5).

Work-related musculoskeletal disorders (WRMSD) are musculoskeletal tissue injuries or disorders that are linked to employment risk factors. (6) These conditions are often referred to as cumulative trauma disorders, repetitive strain injuries (7) and overuse injuries (8).

Musculoskeletal diseases (MSDs) are the most common disorders among computer operators, according to research that have already been undertaken around the world (9, 10, 11, 12).

WRMSDs of the neck are a typical issue for individuals who use computers for extended periods of time (13, 14).

For office computer users, WRNP is a common issue (14, 15, 16). The most recent systematic review found that the probability of neck pain across all workers was highest among computer professionals, with reported incidents ranging from 36% to 57.5% in a year. (17)

In accordance with a 2015 study, the estimated prevalence of office-related neck pain in developing countries like India is 47% (18). Computer professionals are said to experience more neck and shoulder pain than pain in the other limbs. (9, 19, 20)
Pain or tenderness in the neck region, which limits working abilities, is the most frequent cause of work absences among office workers. (21)
Compared to the general population, computer professionals have a two- to three-fold increased risk of developing persistent neck pain. (22)

Cervical Spondylosis and Neck Pain

Neck pain, or cervicalgia, is a common problem; About two-thirds of people have neck pain at some point in their lives. (23) The majority of neck pain is caused by local mechanical issues, despite the fact that the causes of neck pain may be complex. (24)

The majority of patients who complain of neck pain have "non-specific (simple) neck pain, " in which the cause of the symptoms is mechanical or postural. Aetiological factors, such as poor posture, anxiety, depression, neck strain, and sporting or occupational activities, are typically complex and poorly understood (25). The term "cervical spondylosis, " although it is frequently used to refer to all non-specific neck pain, is frequently used when mechanical reasons are prevalent in the disorder (26). In cervical spondylosis, osteophyte formation and involvement of nearby soft tissue structures are the first signs of degenerative changes in the intervertebral discs. However, the line separating normal ageing from disease is difficult to draw because many people over 30 exhibit comparable anomalies on plain radiographs of the cervical spine. (27)

The characteristic radiographic changes of cervical spondylosis are present in about 50% of adults over the age of 50 and 75% of people over the age of 65. (28)

The condition may be associated with generalized neck discomfort, mechanical or axial neck pain, cervical radiculopathy (compression and inflammation of the cervical nerve roots exiting the cervical spine), and cervical myelopathy (compression and inflammation of the nearby cervical spinal cord). (29)

LITERATURE SURVEY

1. **Alqhtani *et al.* (2023)** Incorporating Work Breakdown Structure (WBS) exercises during breaks effectively reduced musculoskeletal discomfort and weariness among hospital personnel, according to a study involving sixty working people. More positive effects on pain and physical exertion were shown with the combination of WBS exercises and instruction than with an education program alone.

2. **Suhara *et al.* (2023)** For the treatment of mechanical neck discomfort in young adults, McKenzie exercises were found to be more beneficial than neck stabilization. These neck strengthening and flexibility exercises improve posture, relieve neck pain, and improve general physical fitness for young individuals with special needs participating in physical education programs.

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4. **Filho and Lucca. (2023)** concluded that proper workplace design can prevent neck disability and labor losses.

5. **Zhou *et al.* (2023)** Deep neck flexor exercises and pressure biofeedback work well together to reduce the symptoms of chronic neck pain. This method improves the sustainability of functional exercises and gives patients real-time exercise feedback. It is a straightforward, practical, and affordable treatment for neck discomfort that can be incorporated into preventative and therapeutic community reeducation initiatives.

6. **Yang *et al.* (2023)** In comparison to traditional neck exercises, traditional Qigong exercises are more effective in treating cervical disc herniation (CDH). Pain and quality of life are significantly improved, and the rate of recurrence is decreased.

7. **Sadeghi *et al.* (2022)** Pain and disability associated with cervical spondylosis may be alleviated by isometric exercises.

8. **Reddy *et al.* (2022)** Reduced cervical joint position sense (JPS) is linked to computer users' forward head posture and neck pain. An expert's treatment plan should be guided by the extent of impairment, pain intensity, functional heart rate, and duration of computer use, as these factors all have an effect on JPS.

9. **Moreira *et al.* (2022)** The quality of life for computer professionals was enhanced by a 17-week office fitness program, particularly in the Pain category. To determine the best exercise styles, intensities, and target areas for computer professionals, more research is required.

10. **Park and Lee (2022)** discovered that a lower trapezius strengthening exercise program carried out on unstable support surfaces can help patients with neck discomfort and forward head posture in terms of reducing neck disability and improving postural alignment.

11. **Hassanen and Hassan (2022)** Found that more than two thirds of IT workers suffer from neck pain.

12. **Deh *et al.* (2022)** To correct respiratory patterns and relieve main symptoms, incorporate breathing exercises into the treatment program for individuals with forward head position and neck pain.

13. **Liao *et al.* (2022)** investigation into how people with neck pain can increase their cervical spine mobility through mind-body exercises. This study showed that patients with neck stiffness experienced better flexion and extension with mind-body activities.

14. **Sharma *et al.* (2022)** A study on the psychological impact of aerobic exercise therapies on cervical spondylosis patients found that these treatments improved overall well-being and reduced anxiety and despair.

15. . **Luyao *et al.* (2022)** Surgery for cervical spondylotic radiculopathy (CSR) offers immediate pain relief, but may not surpass the long-term benefits of conservative treatment, especially for severe cases.

16. **Fu *et al.* (2022)** Static resistance training effectively alleviates clinical symptoms and restores the cervical physiological curve in treating Neck-Type Cervical Spondylosis (NTCS) with Upper Cross Syndrome (UCS).

17. **Kong *et al.* (2022)** A systematic review and meta-analysis found that Traditional Chinese Exercises (TCEs), particularly Baduanjin exercises, can effectively alleviate neck pain in middle-aged and older patients.

18. **Reddy *et al.* (2021)** The study found that kinaesthetic exercise programs significantly improved proprioception, reduced pain, and reduced disability in individuals with cervical spondylosis after 24 sessions.

19. **Hellweg *et al.* (2021)** concluded that more intense rehabilitation programmes improve functional abilities after reviewing the research on the use of physiotherapy in the treatment of neck pain. Additionally, he came to the conclusion that there are currently no standardized recommendations for employing physical therapy to avoid musculoskeletal issues in software engineers, resulting to a considerable level of approach and intensity variation.

20. **Frutiger and Borotkanics (2021)** Office workers with neck pain may benefit from customized workstation adjustments and neck strengthening, according to low-quality evidence; but, more high-quality studies with medical professionals are required to fully evaluate the impact.

21. **Gupta *et al.* (2021)** Functional impairment and pain reduction improved over time, according to a 12-month research assessing the long-term effects of an exercise program on patients with cervical spondylosis.

22. **Mendhe and Borkar (2021)** An exercise program for scapular stabilization was reported to enhance posture over more effective exercise regimens by inducing anatomical modifications, activating neck muscles, and decreasing compensatory movements.

23. **Singh *et al.* (2021**) found that among people who work at desk jobs, combining neck-muscle stretching and strengthening activities improves forward head position and decreases pain.

24. **Reddy *et al.* (2021)** A randomized trial found that a kinaesthetic exercise program significantly improved proprioception, decreased pain intensity, and disability in chronic neck pain patients with cervical spondylosis.

25. **Zoting *et al.* (2021)** The study found that well-planned physical therapy interventions significantly improve symptom relief and quality of life in cases of cervical spondylosis.

26. **Javdaneh *et al.* (2021**) A study found that pain neuroscience education and therapeutic exercises significantly reduced pain-disability index, pain catastrophizing, and fear-avoidance beliefs in chronic neck pain patients, with no significant difference in pain self-efficacy.

27. **Jain *et al.* (2021)** A study found that a specific group of asana practice, done for eight weeks at home, can reduce pain and disability in mild to moderate cervical spondylosis patients, but further trials are needed for validation.

28. **Villanueva *et al.* (2020)** Workplace exercise intervention programs targeting cervical, dorsal, shoulders, rachis, deep stabilizers, core muscles, and scapular stabilization may alleviate neck and back pain, increase worker productivity, and reduce musculoskeletal conditions.

29. **Sundstrup *et al. (*2020)** The risk factors and effective treatments for disorder vary depending on the profession to profession. Therefore, it is advised that each workplace address their problems independently and choose the proper solutions that are practically feasible and suited to their workplace.

30. **Verma *et al.* (2020)** A study found that telephonic follow-up support improved exercise adherence and results in individuals with cervical spondylosis.

31. **Zhang and Fan (2020)** McKenzie therapy and yoga asana training are effective in resolving nerve root compression in cervical spondylosis, resulting in a 30% quicker recovery compared to conventional treatments.

32. **Xiao *et al.* (2020)** Cervical exercises effectively reduce pain, restore cervical function, reduce Recurrence Rate (RR) of pain, and improve Total Recovery Rate (TRR) in individuals with Cervical Spondylotic Localization (CSL).

33. **Rajalaxmi *et al.* (2020)** The study found that core stability exercise effectively treated chronic non-specific neck pain, enhancing NDI (Neck Disability Index), VAS (Visual Analog Scale), and CCFT (Cranio Cervical Flexion Test) scores.

34. **Gallego *et al.* (2020)** This research confirmed the reliability of a mobile app, "forward head posture, " in measuring the craniovertebral angle while standing. The app demonstrated strong reliability (0.88 for intra-rater, 0.83 to 0.89 for inter-rater), good validity (above 0.82), and a minimum detectable change of 4.96° (intra-rater) and 5.52° (in ter-rater). Achieving 94.4% sensitivity and 84.6% specificity, the app proves to be a dependable tool for clinical applications.

35. **Reddy *et al.* (2019)** The study found that individuals with Cervical Spondylosis (CS) had impaired cervical proprioception, leading to increased neck pain intensity and Joint Position Error (JPE).

36. **Basha (2019)** The purpose of the study was to assess, over a four-week period, the effectiveness of dermoneuromodulation (DNM) in treating ten clinically diagnosed patients with cervical spondylosis in terms of neck pain relief and disability reduction. Utilizing evaluations like VAS and NDI, the research showed a considerable decrease in both pain and disability after the application of DNM, demonstrating its usefulness in increasing outcomes for persons with Cervical Spondylosis.

37. **Young *et al.* (2019)** The research examined the psychometric properties of the Neck Disability Index (NDI) and Numeric Pain Rating Scale (NPRS) in individuals suffering from cervicogenic headaches. Both tools are suitable for use as short-term self-report measures with these patients, according to the conclusions.

38. **Chen *et al.* (2019)** A study found that exercise therapy effectively decreased symptomatic neck pain in office workers, with better results in the neck and shoulder regions.

39. **Tiwari and Tiwari (2019)** conducted a study on the impact of Information Technology on the occupational health of computer professionals from various sectors of Dehradun (Uttarakhand). All of the participants had been employed for at least two years and had not recently suffered from a neck or cervical spine injury. Out of the overall population under study, the findings indicated an 11% prevalence of cervical spondylosis.

40. **Zibiri *et al.* (2019)** The study found that muscle energy technique, neck stabilization exercises, and neck care effectively help Non-Specific Chronic Neck Pain (NSCNP) patients manage pain, neck impairment, depression, anxiety, and sleep disturbance.

41. **Liang *et al.* (2019)** A meta-analysis found that exercise, either alone or combined with other treatments, may benefit cervical radiculopathy patients, but each patient should assess options based on unique circumstances.

42. **Srivastava & Prasad (2019)** Certain yoga asanas and exercises including freehand and isometric exercises as well as Bhujangasana, Ardhamatsyendrasana, Ushtrasana, are highly effective for managing cervical spondylosis in daily practice.

43. **Akkan and Gelecek (2018)** This study investigates how well individuals with cervical radiculopathy respond to stabilization exercise training in terms of pain relief, quality of life enhancement, and posture correction.

44. **Yazdania and Wells (2018)** A scoping review identified barriers and enablers in implementing modifications to prevent MSDs, focusing on time, money, management, and training. Enabling factors include training, participation, information, and efficient implementation. Overcoming these challenges can be achieved through management systems.

45. **Chen *et al.* (2018)** discovered that office workers' complaints of neck pain were reduced by strengthening exercises they performed at work, and the effect was stronger when the exercises were performed with the neck and shoulder in mind. It will be important to conduct further RCTs of ergonomic treatments for symptomatic office workers. Further research on the prevention of neck pain is required.

46. **Agarwal *et al.* (2018)** The study analyzed factors influencing exercise adherence in individuals with cervical spondylosis, revealing social support, self-efficacy, and perceived advantages as major drivers.

47. **Iram** et al. **(2018)** Computer office workers frequently experience Complaints of Arm, Neck, and Shoulder (CANS), which are strongly linked to workstation ergonomics.

48. **Ibrahim *et al.* (2018)** A study comparing supervised and unsupervised cervical spondylosis exercise programs found supervised exercises more effective in treating persistent neck pain compared to unsupervised exercises.

49. **Saleh *et al.* (2018)** The study suggests that Deep Cervical Flexors (DCFs) training is a more effective rehabilitation approach than traditional physical therapy for improving neck proprioception, pain relief, muscle strength, and reducing dizziness in cervical spondylosis patients.

50. **Suzuki *et al.* (2018)** With the exception of C7/T1 and C2/3, the most prevalent stage of disc degeneration occurs at contiguous levels in the middle cervical spine (C5/6).

51. **Sugumar (2018)** The study reveals that Simplified Kundalini Yoga (SKY) techniques are highly effective in treating cervical spondylosis, reducing neck pain and stiffness compared to other treatments.

52. **Bobos *et al.* (2018)** This study examines measures for neck issues, discovering that the Neck Disability Index is reliable, and the Northwick Park Neck Pain Questionnaire demonstrates good reliability. The Copenhagen Neck Functional Disability Scale is reliable and has valid results, while the Neck Pain and Disability scale has mixed evidence. The Whiplash Disability Questionnaire is reliable, and the Patient-Specific Functional Scale exhibits good reliability in test-retest reliability.

53. **Henning *et al.* (2017)** A study found that brief breaks combined with exercise are more effective for computer professionals in reducing musculoskeletal discomfort, suggesting active recovery over passive recovery.

54. **Nainzadeh *et al.* (2017)** discovered an 80% prevalence of tension neck syndrome in office (computer) workers.

55. **Darivemula *et al.* (2016)** Work-related neck pain (WRNP) was more prevalent among desk job workers one year later, and the ailment was more common in women. Major contributing factors include prolonged computer use (4-6+ hours) and work-related variables like screen height and posture.

56. **Rahman (2016)** The purpose of the study was to evaluate the overall neck pain, neck range of motion (ROM), neck muscle strength, and neck disability as reported by patients with chronic neck pain before and after Cranio-Cervical Exercises (CCE) in addition to standard therapy. The study comes to the conclusion that using CCE in addition to standard care works better than using standard care alone to treat persistent neck pain.

57. **Hassan *et al.* (2016)** Study compares cervical isometrics alone versus isometrics with stretching for non-specific neck pain. Combined approach shows better pain relief.

58. **Satyanand *et al.* (2015)** According to the study's findings, cervical spondylosis can be effectively treated using yogasanas and relaxation techniques, which relieve neck discomfort and stiffness.

59. **Sarfraznawaz *et al.* (2015)** The study investigated the impact of the upper limb tension test on the relief of ROM and pain in cervical radiculopathy, a method used to control neural mobility.

60. **Shah and Patel (2015)** concluded in their study that computer workers reported a 47% prevalence of neck pain. The results study indicated that both personal and workplace factors can influence neck pain.

61. **Singh *et al.* (2014)** The study correlates age, gender, occupation, and specific cervical spine measurements with cervical spondylosis. It concludes that only age, gender, and occupation pose a risk for developing this condition.

62. **Hu *et al.* (2014)** The randomized controlled clinical trial showed that the 12-words-for-life-nurturing exercise including rubbing face by hands (Xi), combing hairs by fingertips (Shu), massaging ears (Rou), rubbing napex (Cuo), loosening neck (Song), pressing waist (An), turning waist (Zhuan), grinding knees (Mo), squatting hip (Dun), rubbing tri-jiao (Ma), deep breathing (Tu), and regulating the limbs (Tiao) had a promising impact on cervical spondylosis intervention, including pain relief, improved mental

health, and enhanced vitality. This exercise regimen may serve as a potential alternative therapy for cervical spondylosis.

63. **Wani *et al.* (2013)** Cervical retraction exercises with pressure biofeedback demonstrated superior effectiveness compared to performing cervical retraction exercises alone.

64. **Telci and Karaduman (2012)** Exercise treatment shows greater long-term recovery for cervical spondylosis compared to medical treatment.

65. **Murugan (2012)** The study found that isometric neck muscle strengthening exercises, especially those using a thera-band, are an effective preventive strategy for mechanical neck pain.

66. **Diab and Moustafa (2012)** Correction of forward head posture with a corrective exercise program, combined with ultrasound and infrared radiation, led to pain relief, improved craniovertebral angle, and higher dermatomal somatosensory evoked potentials for C6 and C7 in lower cervical spondylotic radiculopathy.

67. **Lindegard *et al.* (2012)** A study on professional computer users found a significant correlation between alleged toil and the onset of symptoms in the shoulder, neck, arm, and hand.

68. **Sharan *et al.* (2011)** The study found that workstyle variables significantly influence discomfort, lost productivity, and musculoskeletal issues among Indian computer professionals, suggesting that workstyle can mediate these issues.

69. **Howell (2011)** The Neck Disability Index (NDI) and Cervical Ranges of Motion (CROM) are effective tools for assessing neck pain and whiplash (WAD) patients, according to a study.

70. **Macdermid *et al.* (2009)** The study evaluated the psychometric properties and utility of the neck disability index (NDI), revealing its strong support and utility as the most commonly used self-report measure for neck pain assessment.

71. **Bustany and Aziz (2009)** Long-term computer use, poor posture, and prolonged use increase the risk of cervical spondylosis, requiring regular breaks and good posture.

72. **Lemack (2008)** Clinical Correlates of Spondylosis are Axial discomfort, arm pain, and myelopathy are the most common indications of cervical spondylosis.

73. **Mishra *et al.* (2004)** A study on IT industry workers found that lowering keyboard height reduces the risk of neck and shoulder MSDs.

74. **Fenety and Walker (2002)** The study examined the impact of regular exercise on employees' musculoskeletal pain, finding that participants experienced an immediate reduction in discomfort.

75. **Voorhies R. M. (2001)** Cervical spondylosis can lead to three main clinical syndromes:
    a. Cervical Radiculopathy (Type I) - Involving nerve roots.
    b. Cervical Myelopathy (Type II) - Related to spinal cord issues.
    c. Axial Joint Pain (Type III) - Also known as mechanical neck pain, involving painful joint dysfunction. These syndromes may overlap or coexist simultaneously.

SCIENTIFIC GAPS

While there may be some studies found on the effects of exercises in cervical spondylosis among the computer professionals but most of the studies were done with variable interventions that lacked uniformity.

As the causes of disorders and their effective treatments differ from profession to profession, It is therefore advised that each profession address their problems separately and choose the suitable solutions that are practically feasible and applicable to their workplace.

The purpose of developing integrated exercises protocol is to apply a level of uniformity or consistency to exercises for computers professionals with Cervical Spondylosis , that may be proved to be effective & helpful to give an authenticated, quality plan with a firm scientifically proved protocol.
Thus integration of exercise protocol for computer professionals is essential.

AIM OF THE STUDY

To develop an appropriate & integrated exercise protocol to effectively manage stage 1 and stage 2 Cervical Spondylosis among computer professionals.

OBJECTIVES

1. To identify and correlate different symptoms of stage 1 and stage 2 Cervical Spondylosis with computer professionals having multiple work patterns.
2. To study different exercises for management of different symptoms of Cervical Spondylosis.
3. Integration and evaluation of different exercises for better management of stage 1 and stage 2 Cervical Spondylosis in different computer professionals.

RESEARCH QUESTION

Will an integrated exercise protocol be effective in the management of stage 1 and stage 2 Cervical Spondylosis in computer professionals ?

HYPOTHESIS

Alternative Hypothesis :

Integrated exercise protocol will be effective in the management of stage 1 and stage 2 Cervical Spondylosis in Computer Professionals.

Null Hypothesis :

Integrated exercise protocol will not be effective in the management of stage 1 and stage 2 cervical spondylosis in computer professionals.

METHODOLOGY

Study Design – Cross – Sectional Sequential Study Design.

Source of Data – Cochrane library, PUBMED , Google Scholar, Elsevier

Data Collection – Google Questionnaire , Physical Assessment

Research Setting – Clinical settings of Delhi-NCR.

Sampling Method – Convenience Sampling Method.

Sample Size - With 11% prevalence of Cervical Spondylosis in Computer Professionals (as indicated in ROL No. 24 – i.e. Mother article) & 10% allowable error, the sample size calculated was 38 with the help of online calculator **Statulator**.

Assuming a 5% loss to follow up , the sample size was increased to 40.
This is the minimum required sample size. The Sample size was increased to 120 to get more reliable research outcomes.

SELECTION CRITERIA

Inclusion Criteria

- Age - 25 to 35 years
- Computers professionals working for at least 5 hours in a day.
- Computer professionals had been employed for at least 2 years.
- Computers professionals who have been diagnosed with stage 1 and stage 2 Cervical Spondylosis and are not advised for surgery by an orthopaedic or Neuro surgeon.
- Both genders — male and female.

Exclusion Criteria

- Work from home Computer Professionals
- had recently suffered from a neck or cervical spine injury.
- Other systemic diseases like Systemic Arthritis, Ankylosing Spondylitis , Rheumatoid Arthritis.
- Any Central Nervous System disease
- Any Cardiorespiratory disease
- Pregnancy

PROCEDURE

1. Identification of target population

2. Selection of Participants

3. Obtain Informed Consent

4. Pre-Intervention assessment :

Symptoms , Work Related Factors & relevant health information through questionnaire or physical assessment.

5. Identification & Integration of different exercises , implementation of the Integrated protocol :

It will consist of following three phases:

A. a) Development Phase

i) Search for ROL

ii) Data Collection

b) Setting of protocol

B. a) Testing/ Validation of the protocol

b) Sending the set protocol to the professional for expert opinion

C. Application of the validated protocol

6. Post-Intervention Assessment:

To evaluate changes in cervical spondylosis symptoms.

7. Data Analysis:

Analyze the pre-post data to determine the effectiveness of the exercise protocol in reducing cervical spondylosis symptoms.

8. Results Interpretation:

Interpret the results, considering any limitations in the study design and potential implications for integrating exercise protocols in the workplace.

DATA ANALYSIS

Data will be analyzed using SYSTAT 13.2.

- **Test for Pre and Post Intervention Assessment :**
  - Paired T-Test –If the data is normally distributed
  - Wilcoxon Signed-Rank Test- If the data is not normally distributed.

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3. **Yaghoubitajani *et al.* (2023)** An 8-week annual fitness program can increase employee productivity and well-being, providing useful and affordable options for companies looking to improve health of their workforce.

4. **Filho and Lucca. (2023)** concluded that proper workplace design can prevent neck disability and labor losses.

5. **Zhou *et al.* (2023)** Deep neck flexor exercises and pressure biofeedback work well together to reduce the symptoms of chronic neck pain. This method improves the sustainability of functional exercises and gives patients real-time exercise feedback. It is a straightforward, practical, and affordable treatment for neck discomfort that can be incorporated into preventative and therapeutic community reeducation initiatives.

6. **Yang *et al.* (2023)** In comparison to traditional neck exercises, traditional Qigong exercises are more effective in treating cervical disc herniation (CDH). Pain and quality of life are significantly improved, and the rate of recurrence is decreased.

7. **Sadeghi *et al*. (2022)** Pain and disability associated with cervical spondylosis may be alleviated by isometric exercises.

8. **Reddy *et al.* (2022)** Reduced cervical joint position sense (JPS) is linked to computer users' forward head posture and neck pain. An expert's treatment plan should be guided by the extent of impairment, pain intensity, functional heart rate, and duration of computer use, as these factors all have an effect on JPS.

9. **Moreira *et al. (*2022)** The quality of life for computer professionals was enhanced by a 17-week office fitness program, particularly in the Pain category. To determine the best exercise styles, intensities, and target areas for computer professionals, more research is required.

10. **Park and Lee (2022)** discovered that a lower trapezius strengthening exercise program carried out on unstable support surfaces can help patients with neck discomfort and forward head posture in terms of reducing neck disability and improving postural alignment.

11. **Hassanen and Hassan (2022)** Found that more than two thirds of IT workers suffer from neck pain.

12. **Deh *et al. (*2022)** To correct respiratory patterns and relieve main symptoms, incorporate breathing exercises into the treatment program for individuals with forward head position and neck pain.

13. **Liao *et al. (*2022)** investigation into how people with neck pain can increase their cervical spine mobility through mind-body exercises. This study showed that patients with neck stiffness experienced better flexion and extension with mind-body activities.

14. **Sharma *et al.* (2022)** A study on the psychological impact of aerobic exercise therapies on cervical spondylosis patients found that these treatments improved overall well-being and reduced anxiety and despair.

15. **. Luyao *et al.* (2022)** Surgery for cervical spondylotic radiculopathy (CSR) offers immediate pain relief, but may not surpass the long-term benefits of conservative treatment, especially for severe cases.

16. **Fu *et al*. (2022)** Static resistance training effectively alleviates clinical symptoms and restores the cervical physiological curve in treating Neck-Type Cervical Spondylosis (NTCS) with Upper Cross Syndrome (UCS).

17. **Kong *et al.* (2022)** A systematic review and meta-analysis found that Traditional Chinese Exercises (TCEs), particularly Baduanjin exercises, can effectively alleviate neck pain in middle-aged and older patients.

18. **Reddy *et al.* (2021)** The study found that kinaesthetic exercise programs significantly improved proprioception, reduced pain, and reduced disability in individuals with cervical spondylosis after 24 sessions.

19. **Hellweg *et al.* (2021)** concluded that more intense rehabilitation programmes improve functional abilities after reviewing the research on the use of physiotherapy in the treatment of neck pain. Additionally, he came to the conclusion that there are currently no standardized recommendations for employing physical therapy to avoid musculoskeletal issues in software engineers, resulting to a considerable level of approach and intensity variation.

20. **Frutiger and Borotkanics (2021)** Office workers with neck pain may benefit from customized workstation adjustments and neck strengthening, according to low-quality evidence; but, more high-quality studies with medical professionals are required to fully evaluate the impact.

21. **Gupta *et al.* (2021)** Functional impairment and pain reduction improved over time, according to a 12-month research assessing the long-term effects of an exercise program on patients with cervical spondylosis.

22. **Mendhe and Borkar (2021)** An exercise program for scapular stabilization was reported to enhance posture over more effective exercise regimens by inducing anatomical modifications, activating neck muscles, and decreasing compensatory movements.

23. **Singh *et al.* (2021**) found that among people who work at desk jobs, combining neck-muscle stretching and strengthening activities improves forward head position and decreases pain.

24. **Reddy *et al.* (2021)** A randomized trial found that a kinaesthetic exercise program significantly improved proprioception, decreased pain intensity, and disability in chronic neck pain patients with cervical spondylosis.

25. **Zoting *et al.* (2021)** The study found that well-planned physical therapy interventions significantly improve symptom relief and quality of life in cases of cervical spondylosis.

26. **Javdaneh *et al.* (2021**) A study found that pain neuroscience education and therapeutic exercises significantly reduced pain-disability index, pain catastrophizing, and fear-avoidance beliefs in chronic neck pain patients, with no significant difference in pain self-efficacy.

27. **Jain *et al.* (2021)** A study found that a specific group of asana practice, done for eight weeks at home, can reduce pain and disability in mild to moderate cervical spondylosis patients, but further trials are needed for validation.

28. **Villanueva *et al.* (2020)** Workplace exercise intervention programs targeting cervical, dorsal, shoulders, rachis, deep stabilizers, core muscles, and scapular stabilization may alleviate neck and back pain, increase worker productivity, and reduce musculoskeletal conditions.

29. **Sundstrup *et al. (*2020)** The risk factors and effective treatments for disorder vary depending on the profession to profession. Therefore, it is advised that each workplace address their problems independently and choose the proper solutions that are practically feasible and suited to their workplace.

30. **Verma *et al.* (2020)** A study found that telephonic follow-up support improved exercise adherence and results in individuals with cervical spondylosis.

31. **Zhang and Fan (2020)** McKenzie therapy and yoga asana training are effective in resolving nerve root compression in cervical spondylosis, resulting in a 30% quicker recovery compared to conventional treatments.

32. **Xiao *et al.* (2020)** Cervical exercises effectively reduce pain, restore cervical function, reduce Recurrence Rate (RR) of pain, and improve Total Recovery Rate (TRR) in individuals with Cervical Spondylotic Localization (CSL).

33. **Rajalaxmi *et al.* (2020)** The study found that core stability exercise effectively treated chronic non-specific neck pain, enhancing NDI (Neck Disability Index), VAS (Visual Analog Scale), and CCFT (Cranio Cervical Flexion Test) scores.

34. **Gallego *et al.* (2020)** This research confirmed the reliability of a mobile app, "forward head posture, " in measuring the craniovertebral angle while standing. The app demonstrated strong reliability (0.88 for intra-rater, 0.83 to 0.89 for inter-rater), good validity (above 0.82), and a minimum detectable change of 4.96° (intra-rater) and 5.52° (in ter-rater). Achieving 94.4% sensitivity and 84.6% specificity, the app proves to be a dependable tool for clinical applications.

35. **Reddy *et al.* (2019)** The study found that individuals with Cervical Spondylosis (CS) had impaired cervical proprioception, leading to increased neck pain intensity and Joint Position Error (JPE).

36. **Basha (2019)** The purpose of the study was to assess, over a four-week period, the effectiveness of dermoneuromodulation (DNM) in treating ten clinically diagnosed patients with cervical spondylosis in terms of neck pain relief and disability reduction. Utilizing evaluations like VAS and NDI, the research showed a considerable decrease in both pain and disability after the application of DNM, demonstrating its usefulness in increasing outcomes for persons with Cervical Spondylosis.

37. **Young *et al.* (2019)** The research examined the psychometric properties of the Neck Disability Index (NDI) and Numeric Pain Rating Scale (NPRS) in individuals suffering from cervicogenic headaches. Both tools are suitable for use as short-term self-report measures with these patients, according to the conclusions.

38. **Chen *et al.* (2019)** A study found that exercise therapy effectively decreased symptomatic neck pain in office workers, with better results in the neck and shoulder regions.

39. **Tiwari and Tiwari (2019)** conducted a study on the impact of Information Technology on the occupational health of computer professionals from various sectors of Dehradun (Uttarakhand). All of the participants had been employed for at least two years and had not recently suffered from a neck or cervical spine injury. Out of the overall population under study, the findings indicated an 11% prevalence of cervical spondylosis.

40. **Zibiri *et al.* (2019)** The study found that muscle energy technique, neck stabilization exercises, and neck care effectively help Non-Specific Chronic Neck Pain (NSCNP) patients manage pain, neck impairment, depression, anxiety, and sleep disturbance.

41. **Liang *et al.* (2019)** A meta-analysis found that exercise, either alone or combined with other treatments, may benefit cervical radiculopathy patients, but each patient should assess options based on unique circumstances.

42. **Srivastava & Prasad (2019)** Certain yoga asanas and exercises including freehand and isometric exercises as well as Bhujangasana, Ardhamatsyendrasana, Ushtrasana, are highly effective for managing cervical spondylosis in daily practice.

43. **Akkan and Gelecek (2018)** This study investigates how well individuals with cervical radiculopathy respond to stabilization exercise training in terms of pain relief, quality of life enhancement, and posture correction.

44. **Yazdania and Wells (2018)** A scoping review identified barriers and enablers in implementing modifications to prevent MSDs, focusing on time, money, management, and training. Enabling factors include training, participation, information, and efficient implementation. Overcoming these challenges can be achieved through management systems.

45. **Chen *et al. (*2018**) discovered that office workers' complaints of neck pain were reduced by strengthening exercises they performed at work, and the effect was stronger when the exercises were performed with the neck and shoulder in mind. It will be important to conduct further RCTs of ergonomic treatments for symptomatic office workers. Further research on the prevention of neck pain is required.

46. **Agarwal *et al.* (2018**) The study analyzed factors influencing exercise adherence in individuals with cervical spondylosis, revealing social support, self-efficacy, and perceived advantages as major drivers.

47. **Iram *et al.* (2018)** Computer office workers frequently experience Complaints of Arm, Neck, and Shoulder (CANS), which are strongly linked to workstation ergonomics.

48. **Ibrahim *et al.* (2018)** A study comparing supervised and unsupervised cervical spondylosis exercise programs found supervised exercises more effective in treating persistent neck pain compared to unsupervised exercises.

49. **Saleh *et al.* (2018)** The study suggests that Deep Cervical Flexors (DCFs) training is a more effective rehabilitation approach than traditional physical therapy for improving neck proprioception, pain relief, muscle strength, and reducing dizziness in cervical spondylosis patients.

50. **Suzuki *et al.* (2018)** With the exception of C7/T1 and C2/3, the most prevalent stage of disc degeneration occurs at contiguous levels in the middle cervical spine (C5/6).

51. **Sugumar (2018)** The study reveals that Simplified Kundalini Yoga (SKY) techniques are highly effective in treating cervical spondylosis, reducing neck pain and stiffness compared to other treatments.

52. **Bobos *et al.* (2018)** This study examines measures for neck issues, discovering that the Neck Disability Index is reliable, and the Northwick Park Neck Pain Questionnaire demonstrates good reliability. The Copenhagen Neck Functional Disability Scale is reliable and has valid results, while the Neck Pain and Disability scale has mixed evidence. The Whiplash Disability Questionnaire is reliable, and the Patient-Specific Functional Scale exhibits good reliability in test-retest reliability.

53. **Henning *et al.* (2017**) A study found that brief breaks combined with exercise are more effective for computer professionals in reducing musculoskeletal discomfort, suggesting active recovery over passive recovery.

54. **Nainzadeh *et al.* (2017)** discovered an 80% prevalence of tension neck syndrome in office (computer) workers.

55. **Darivemula *et al.* (2016)** Work-related neck pain (WRNP) was more prevalent among desk job workers one year later, and the ailment was more common in women. Major contributing factors include prolonged computer use (4-6+ hours) and work-related variables like screen height and posture.

56. **Rahman (2016)** The purpose of the study was to evaluate the overall neck pain, neck range of motion (ROM), neck muscle strength, and neck disability as reported by patients with chronic neck pain before and after Cranio-Cervical Exercises (CCE) in addition to standard therapy. The study comes to the conclusion that using CCE in addition to standard care works better than using standard care alone to treat persistent neck pain.

57. **Hassan *et al.* (2016)** Study compares cervical isometrics alone versus isometrics with stretching for non-specific neck pain. Combined approach shows better pain relief.

58. **Satyanand *et al.* (2015)** According to the study's findings, cervical spondylosis can be effectively treated using yogasanas and relaxation techniques, which relieve neck discomfort and stiffness.

59. **Sarfraznawaz *et al.* (2015**) The study investigated the impact of the upper limb tension test on the relief of ROM and pain in cervical radiculopathy, a method used to control neural mobility.

60. **Shah and Patel (2015)** concluded in their study that computer workers reported a 47% prevalence of neck pain. The results study indicated that both personal and workplace factors can influence neck pain.

61. **Singh *et al.* (2014)** The study correlates age, gender, occupation, and specific cervical spine measurements with cervical spondylosis. It concludes that only age, gender, and occupation pose a risk for developing this condition.

62. **Hu *et al.* (2014)** The randomized controlled clinical trial showed that the 12-words-for-life-nurturing exercise including rubbing face by hands (Xi), combing hairs by fingertips (Shu), massaging ears (Rou), rubbing napex (Cuo), loosening neck (Song), pressing waist (An), turning waist (Zhuan), grinding knees (Mo), squatting hip (Dun), rubbing tri-jiao (Ma), deep breathing (Tu), and regulating the limbs (Tiao) had a promising impact on cervical spondylosis intervention, including pain relief, improved mental

health, and enhanced vitality. This exercise regimen may serve as a potential alternative therapy for cervical spondylosis.

63. **Wani *et al.* (2013)** Cervical retraction exercises with pressure biofeedback demonstrated superior effectiveness compared to performing cervical retraction exercises alone.

64. **Telci and Karaduman (2012)** Exercise treatment shows greater long-term recovery for cervical spondylosis compared to medical treatment.

65. **Murugan (2012)** The study found that isometric neck muscle strengthening exercises, especially those using a thera-band, are an effective preventive strategy for mechanical neck pain.

66. **Diab and Moustafa (2012)** Correction of forward head posture with a corrective exercise program, combined with ultrasound and infrared radiation, led to pain relief, improved craniovertebral angle, and higher dermatomal somatosensory evoked potentials for C6 and C7 in lower cervical spondylotic radiculopathy.

67. **Lindegard *et al.* (2012)** A study on professional computer users found a significant correlation between alleged toil and the onset of symptoms in the shoulder, neck, arm, and hand.

68. **Sharan *et al.* (2011)** The study found that workstyle variables significantly influence discomfort, lost productivity, and musculoskeletal issues among Indian computer professionals, suggesting that workstyle can mediate these issues.

69. **Howell (2011)** The Neck Disability Index (NDI) and Cervical Ranges of Motion (CROM) are effective tools for assessing neck pain and whiplash (WAD) patients, according to a study.

70. **Macdermid *et al.* (2009)** The study evaluated the psychometric properties and utility of the neck disability index (NDI), revealing its strong support and utility as the most commonly used self-report measure for neck pain assessment.

71. **Bustany and Aziz (2009)** Long-term computer use, poor posture, and prolonged use increase the risk of cervical spondylosis, requiring regular breaks and good posture.

72. **Lemack (2008)** Clinical Correlates of Spondylosis are Axial discomfort, arm pain, and myelopathy are the most common indications of cervical spondylosis.

73. **Mishra *et al.* (2004)** A study on IT industry workers found that lowering keyboard height reduces the risk of neck and shoulder MSDs.

74. **Fenety and Walker (2002)** The study examined the impact of regular exercise on employees' musculoskeletal pain, finding that participants experienced an immediate reduction in discomfort.

75. **Voorhies R. M. (2001)** Cervical spondylosis can lead to three main clinical syndromes:
    a. Cervical Radiculopathy (Type I) - Involving nerve roots.
    b. Cervical Myelopathy (Type II) - Related to spinal cord issues.
    c. Axial Joint Pain (Type III) - Also known as mechanical neck pain, involving painful joint dysfunction. These syndromes may overlap or coexist simultaneously.

SCIENTIFIC GAPS

While there may be some studies found on the effects of exercises in cervical spondylosis among the computer professionals but most of the studies were done with variable interventions that lacked uniformity.

As the causes of disorders and their effective treatments differ from profession to profession, It is therefore advised that each profession address their problems separately and choose the suitable solutions that are practically feasible and applicable to their workplace.

The purpose of developing integrated exercises protocol is to apply a level of uniformity or consistency to exercises for computers professionals with Cervical Spondylosis , that may be proved to be effective & helpful to give an authenticated, quality plan with a firm scientifically proved protocol.
Thus integration of exercise protocol for computer professionals is essential.

AIM OF THE STUDY

To develop an appropriate & integrated exercise protocol to effectively manage stage 1 and stage 2 Cervical Spondylosis among computer professionals.

OBJECTIVES

1. To identify and correlate different symptoms of stage 1 and stage 2 Cervical Spondylosis with computer professionals having multiple work patterns.
2. To study different exercises for management of different symptoms of Cervical Spondylosis.
3. Integration and evaluation of different exercises for better management of stage 1 and stage 2 Cervical Spondylosis in different computer professionals.

RESEARCH QUESTION

Will an integrated exercise protocol be effective in the management of stage 1 and stage 2 Cervical Spondylosis in computer professionals ?

HYPOTHESIS

Alternative Hypothesis :

Integrated exercise protocol will be effective in the management of stage 1 and stage 2 Cervical Spondylosis in Computer Professionals.

Null Hypothesis :

Integrated exercise protocol will not be effective in the management of stage 1 and stage 2 cervical spondylosis in computer professionals**.**

METHODOLOGY

Study Design – Cross – Sectional Sequential Study Design.

Source of Data – Cochrane library, PUBMED , Google Scholar, Elsevier

Data Collection – Google Questionnaire , Physical Assessment

Research Setting – Clinical settings of Delhi-NCR.

Sampling Method – Convenience Sampling Method.

Sample Size - With 11% prevalence of Cervical Spondylosis in Computer Professionals (as indicated in ROL No. 24 – i.e. Mother article) & 10% allowable error, the sample size calculated was 38 with the help of online calculator **Statulator**.

Assuming a 5% loss to follow up , the sample size was increased to 40.
This is the minimum required sample size. The Sample size was increased to 120 to get more reliable research outcomes.

SELECTION CRITERIA

Inclusion Criteria

- Age - 25 to 35 years
- Computers professionals working for at least 5 hours in a day.
- Computer professionals had been employed for at least 2 years.
- Computers professionals who have been diagnosed with stage 1 and stage 2 Cervical Spondylosis and are not advised for surgery by an orthopaedic or Neuro surgeon.
- Both genders — male and female.

Exclusion Criteria

- Work from home Computer Professionals
- had recently suffered from a neck or cervical spine injury.
- Other systemic diseases like Systemic Arthritis, Ankylosing Spondylitis , Rheumatoid Arthritis.
- Any Central Nervous System disease
- Any Cardiorespiratory disease
- Pregnancy

PROCEDURE

1. Identification of target population

2. Selection of Participants

3. Obtain Informed Consent

4. Pre-Intervention assessment :

Symptoms , Work Related Factors & relevant health information through questionnaire or physical assessment.

5. Identification & Integration of different exercises , implementation of the Integrated protocol :

It will consist of following three phases:

A. a) Development Phase

i) Search for ROL

ii) Data Collection

b) Setting of protocol

B. a) Testing/ Validation of the protocol

b) Sending the set protocol to the professional for expert opinion

C. Application of the validated protocol

6. Post-Intervention Assessment:

To evaluate changes in cervical spondylosis symptoms.

7. Data Analysis:

Analyze the pre-post data to determine the effectiveness of the exercise protocol in reducing cervical spondylosis symptoms.

8. Results Interpretation:

Interpret the results, considering any limitations in the study design and potential implications for integrating exercise protocols in the workplace.

DATA ANALYSIS

Data will be analyzed using SYSTAT 13.2.

- **Test for Pre and Post Intervention Assessment :**

  - Paired T-Test –If the data is normally distributed
  - Wilcoxon Signed-Rank Test- If the data is not normally distributed.